Simpson

INSTRUMENTS THAT STAY ACCURATE

260 Add-A-Tester Adapter

OPERATOR'S MANUAL

DC VTVM
MODEL 651

SIMPSON ELECTRIC COMPANY
5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121
In Canada, Bach-Simpson, Ltd., London, Ontario

New SIMPSON 260 "Add-A-Tester" Line

TRANSISTOR TESTER, Model 650 . . . . . $26.95
Beta Ranges: 0-10, 0-50, 0-250, (F.S.)
Beta Accuracy: ±3%, with 260 ±5% nominal
Ico Range: 0-100 ua
Ico Accuracy: ±1%, with 260 ±3% (F.S.)

DC VTVM, Model 651 . . . . . $32.95
Voltage Ranges: 0-.5/1.0/2.5/5.0/10/25/50/100/250/500
Accuracy: ±1%, with 260 ±3% (F.S.)
Input Impedance: greater than 10 megs all ranges

TEMPERATURE TESTER, Model 652 . . . $38.95
Temperature Ranges: −50°F to +100°F, +100°F to +250°F
Accuracy: with 260 ±2° (nominal)
Three lead positions provided
Sensing Element: thermistor

AC AMMETER, Model 653 . . . . . $18.95
Ranges: 0-0.25/1/2.5/12.5/25 amps
Accuracy: ±1%, with 260 ±3% nominal
Frequency Range: 50 cycles to 3000 cycles

AUDIO WATTMETER, Model 654 . . . . . $18.95
Load Ranges: 4,8,16,600 ohms
Wattage: Continuous 25 watts (8,600 ohms)
50 watts (4,16 ohms)
Intermittent 50 watts (8,600 ohms)
100 watts (4,16 ohms)
Accuracy: ±5%, with 260 ±10% nominal
Direct reading scale from 17 microwatts to 100 watts

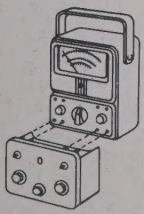
MICROVOLT ATTENUATOR, Model 655 . $18.95
Ranges: 2.5 microvolts to 250,000 microvolts continuously variable in decade steps
Frequency: DC to 20 KC
Accuracy: ±1db

BATTERY TESTER, Model 656 . . . . . $19.95
Checks all radio and hearing aid batteries up to 90 volts at the manufacturer's recommended load, or any external load.

Note: All Simpson 260 Adapters provide for normal 260 usage without disconnecting the adapter.

OPERATOR'S MANUAL

DC VTVM
MODEL 651



Just plug it in

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121

In Canada, Bach-Simpson, Ltd., London, Ontario

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FIGURE 1 – SIMPSON MODEL 651 DC VTVM

OPERATOR'S MANUAL

SIMPSON – MODEL 651 DC VTVM

SECTION I

GENERAL DESCRIPTION

INTRODUCTION

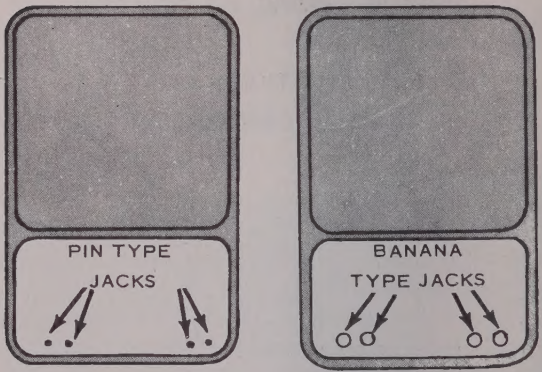
The Simpson Model 651 DC VTVM is an accurate, compact and self-powered instrument designed to give a DC Voltage coverage heretofore found only in laboratory type instruments. High sensitivity is incorporated for transistor circuitry; high impedance for AGC measurements; and multirange for better accuracy of reading.

By utilizing the Simpson 260 Adapter concept of combining a high quality **260*** or **270** VOM with unique adapter circuitry, a quality to cost figure is achieved that is without equal.

ACCESSORIES FURNISHED

Each instrument is furnished with one DC volts probe with lead, one ground lead with banana plug and four extra pin-type plugs. If the Model 651 is to be used with a **260** Series II, it will be necessary to unscrew the four banana plugs at the top of the unit and replace with the four pin-type plugs. See Figure 2 for **260** Series identification.

*Trade Mark Registered U. S. Patent Office.



(a) 260, Series II (b) 260, Series III

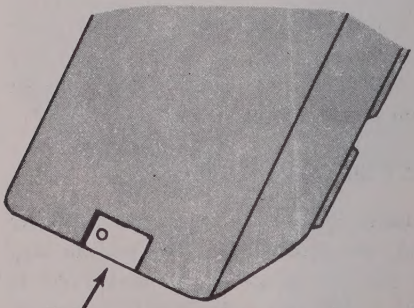


FIGURE 2 – 260* SERIES IDENTIFICATION

*Trade Mark Registered U. S. Patent Office.

SPECIFICATIONS

Ranges –
DC Volts 0-.5/1.0/2.5/5/10/25/50/100/250/500

Input Resistance
10 Megohms (minimum)

Accuracy
DC Volts
Adapter only ± 1%
Adapter with **260** ± 3% F.S. (nominal)
± 5% of reading (nominal)
Adapter with **270** ± 2% F.S. (nominal)
± 4% of reading (nominal)

POWER REQUIREMENTS

2 – 1.34 volt Mallory type ZM-9 mercury batteries
2 – 30 volts Eveready type 413 batteries

SIZE	WEIGHT
5-5/16 x 4-3/8 x 3-7/16	2 pounds

MODIFICATION KITS

Adapter Case Kit 401 for 260 Series III and 270.

This kit is optional for converting early production (produced prior to June 1, 1959) **260** Series III or **270** cases to permit locking of the Model 651

to the VOM. It consists of a new case and instructions. The new case permits the adapter latch underneath the Model 651 to be locked securely to the underside of the VOM.

Adapter Case Kit 402 for 260 Series II.

This kit is required for conversion of the **260** Series II, to electrically accomodate the Model 651. It includes the instructions and parts necessary for the conversion, and provides a 50 microampere D.C. range in the instrument.

FUNCTION OF CONTROLS

DC VOLTS Switch

This is a 10 position switch located on the left side of the front panel which is used to select the desired D.C. volts range.

FUNCTION Switch

The FUNCTION switch is a 3 position switch located on the right side of the front panel. The battery power to the Model 651 is turned off when this switch is in the OFF position. Turning this switch to the right turns on the battery power and also selects the desired polarity. The two operating positions are marked POS. and NEG. indicating the polarity of the D.C. probe.

NOTE

When the Model 651 is not in use, keep the FUNCTION switch set at OFF to prolong battery life.

ZERO ADJ. (Electrical)

With the Adapter energized and properly connected to a **260** or **270,** and the DC VOLTS switch placed in the desired voltage range position, the ZERO ADJ. control is turned to the right or left until the pointer is directly over the zero mark on the **260/270** scale. When making this adjustment, the D.C. probe should be connected to the ground lead. When changing ranges or polarity, it may be necessary to re-adjust for zero.

260 – 651 Switch

The small switch at the bottom center of the front panel is a convenience switch. It permits use of the Multimeter alone without detaching the Model 651.

SECTION II

OPERATING INSTRUCTIONS

1. Initial Adjustments

a. 260/270 Control Settings.

1. With the Model 651 disconnected, check the meter pointer position for zero indication in its operating position. If the pointer is off zero, adjust the bakelite screw just under the meter. Refer to the VOM Operator's Manual for this adjustment.

2. Set the **260/270** polarity switch to the +DC position.

3. Set the **260/270** range switch to the 50V position.

b. Model 651 Control Settings.

1. Set the FUNCTION switch to the OFF position.

2. Set the DC VOLTS range switch to the 500 position.

3. Set the 260–651 switch to the 651 Adapter position.

c. Connecting the 651 to the 260/270.

1. Insert the top four plugs of the Model 651 into the lower four jacks of the **260/270.**

2. Insert the short lead from the Model 651 into the 50 μAMPS jack.

3. Position the adapter locking latch, underneath the instrument, to secure the two units.

CAUTION

If your **260/270** case does not have the locking provision, avoid applying excessive pressure to the top of the Adapter when it is connected to the Multimeter. A modification kit which includes a new case with an adapter locking provision is recommended for optimum rigidity (see page 3).

MEASURING DC VOLTAGES

1. Place the FUNCTION switch of the Model 651 in the POS. or NEG. position, depending upon the polarity of the voltage to be measured.

2. Rotate the DC VOLTS switch of the Model 651 to any one of the ten voltage positions. If the voltage to be measured is unknown, always use the highest voltage range first. After the first reading, the switch can be reset to a lower range if needed, for a more accurate reading.

3. Connect the probe lead to the connector marked DCV, and plug the black test lead into the jack marked GND.

4. Turn on power to the circuit under test and connect the ground lead of the 651 to the common side of the circuit to be tested. Place the end of the probe on the point to be checked. If the pointer deflects to the left of zero, the polarity is incorrect and the FUNCTION switch should be switched to the other polarity position.

5. Read the voltage on the black arc of the **260/270** which is second from the top. Use the appropriate scale for the range selected as follows:

651 RANGE SELECTED	**260/270** SCALE	DIVIDE OR MULTIPLY BY
.5 Volts	0–50	÷100
1.0 Volts	0–10	÷10
2.5 Volts	0–250	÷100
3.0 Volts	0–50	÷10
10.0 Volts	0–10	Read Directly
25.0 Volts	0–250	÷10
50.0 Volts	0–50	Read Directly
100.0 Volts	0–10	×10
250.0 Volts	0–250	Read Directly
500.0 Volts	0–50	×10

When not in use, place the FUNCTION switch of the Model 651 in its OFF position to prolong battery life.

NOTE

Before setting the FUNCTION switch at OFF set the 260–651 switch at 260 Direct. This prevents overdriving the VOM pointer when the Model 651 power is turned off.

SECTION III

MAINTENANCE

CARE

The Model 651 is a very rugged instrument designed to withstand the wear of every day service work. Nevertheless, it should receive the care given to other fine electronic equipment and should not be subjected to excessively rough treatment.

CASE REMOVAL

To remove the instrument from the case, remove the four screws located in the four corners on the back of the instrument case. All the components

are attached to the front panel. Be sure the instrument is detached from the Multimeter and test leads are removed.

BATTERY REPLACEMENT

The unit contains two 1.34 volt Mallory mercury batteries No. ZM-9, and two 30 volt Eveready batteries No. 413.

To maintain optimum performance from the Model 651, the batteries should be periodically checked. If the voltage falls below 25% of rated voltage, the battery(s) should be replaced. To remove the battery(s), open the unit as described above and merely grasp both ends of the battery, and pull in an outwardly direction. When replacing, be certain that the polarity of the battery(s) corresponds with the polarity marks on the chassis. Battery(s) replacement will not affect the calibration.

NOTE

Toward the end of life, the voltages of the 30 volt B batteries may differ and it may not be possible to zero adjust the 651. If the weaker battery has greater than 25% of its rated voltage, interchange the two for an extended period of use.

CALIBRATION

The Model 651 has been carefully calibrated at the factory and no further changes should be necessary.

NOTE

If recalibration appears to be necessary, check both the Multimeter used and the Model 651 to determine which unit may require re-calibration.

When the 1AG4 tube is replaced, use the following procedure:

1. Allow the Model 651 to warm up for approximately ¼ hour. Set the FUNCTION switch in the POS. position.

2. With test leads attached to the unit, connect the DC probe to the ground lead and adjust the ZERO ADJ. control for zero. Disconnect (separate) the leads.

3. Apply 0.5 volt, with the range switch set in the 0.5 volt position. Check for exactly a full-scale indication. If necessary, adjust R-16 until the meter reads correctly.

4. Check each remaining voltage range with an appropriate voltage standard. The accuracy on each range should be better than ± 3% F.S. If it is not, check the attenuator resistors.

REPLACEMENT OF PARTS

All the components of the Model 651 have been engineered for use over a long period of time. However, there are conditions under which parts may become damaged or faulty and require replacement. Refer to the circuit diagram, Figure 3, to help identify and locate any suspected part. All parts should be ordered from your local Simpson Authorized Parts station, with the part number specified in your order. See the list of Authorized Repair and Parts Stations beginning on page 15.

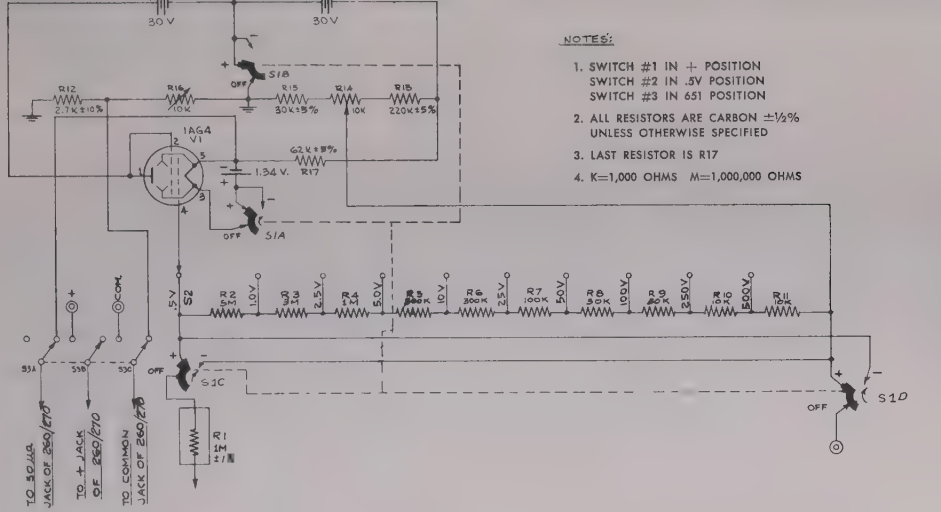


FIGURE 3 – SCHEMATIC DIAGRAM, MODEL 651 DC VTVM*

*PATENT APPLIED FOR

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	Resistor, 1 megohm, ±1%, ½ w	1–113392
R2	Resistor, 5 megohms, ±½%, ½ w	1–118181
R3	Resistor, 3 megohms, ±½%, ½ w	1–118182
R4	Resistor, 1 megohm, ±½%, ½ w	1–118183
R5	Resistor, 500K ohms, ±½%, ½ w	1–118184
R6	Resistor, 300K ohms, ±½%, ½ w	1–118185
R7	Resistor, 100K ohms, ±½%, ½ w	1–118186
R8	Resistor, 50K ohms, ±½%, ½ w	1–118187
R9	Resistor, 30K ohms, ±½%, ½ w	1–118188
R10	Resistor, 10K ohms, ±½%, ½ w	1–118189
R11	Resistor, 10K ohms, ±½%, ½ w	1–118189
R12	Resistor, 2.7K ohms, ±10%, ½ w	1–113942
R13	Resistor, 220 ohms, ±5%, ½ w	1–117536
R14	Potentiometer, 10K ohms, ±30%, ½ w	1–118118
R15	Resistor, 30K ohms, ±5%, ½ w	1–114878
R16	Rheostat, 10K ohms, ±10%, 1 w	1–118269
R17	Resistor, 62K ohms, ±5%, ½ w	1–115449
S1	Switch, 4-poles, 3-positions	1–118125
S2	Switch, 1-pole, 10-positions	1–118054
S3	Switch, 3-poles, 2-positions	1–118102
V1	Tube, type 1AG4	1–118493
	D.C. Volts Probe	10–890067
	Ground Lead	10–837547

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

*California, Los Angeles ADams 2-4201
Quality Electric Company
3700 South Broadway
States: So. California below Fresno and Arizona

*California, San Francisco GArfield 1-7185
Pacific Electrical Instrument Lab.
111 Main Street
States: No. California above Fresno and Nevada

Canada
Bach-Simpson Ltd. GLadstone 1-9490
1255 Brydges Street
P.O. Box 484
London, Ontario, Canada

*Colorado, Denver RAce 2-8670
Meter-Master Instrument Service
2379 Downing Street
States: Wyoming, Utah, Colo. and New Mexico

*Georgia, Atlanta PLaza 3-4128
Electro-Tech Equipment
690 Murphy Avenue S. W.
States: Alabama, Georgia, Florida,
No. & So. Carolina, and Tenn.

*Parts Depots

*Illinois, Chicago COlumbus 1-1330
Pacific Indicator Company
5217 W. Madison Street
States: Chicago, Wisconsin and Indiana

*Louisiana, New Orleans TWinbrook 5-5621
Industrial Instrument Works
3328 Magazine Street
States: Arkansas, Mississippi and Louisiana

*Massachusetts, Cambridge UNiversity 4-2494
Alvin C. Mancib Company
363 Walden Street
States: Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island and Maine

*Michigan, Detroit LIncoln 7-1000
Ram Meter, Inc.
1100 Hilton Road, Ferndale
States: Michigan

*Minnesota, Minneapolis KEllogg 7-5411
Instrumentation Services
917 Plymouth Avenue
States: Minnesota, North and South Dakota

*Missouri, St. Louis FOrest 7-9799
Scherrer Instruments
5449 Delmar Blvd.
States: Illinois below Peoria, Iowa, Missouri, and Kansas

*New York, Buffalo EXport 2-2726
Electrical Instrument Labs.
1487 Hertal Avenue
States: New York State except Met. N. Y.

*New York 7, New York BArclay 7-4977
Simpson Instrument Service Corp.
27 Park Place
States: Metropolitan New York and New Jersey, above Trenton

New York, Syracuse HYatt 2-1651
Syracuse Instrument Lab.
2904 South Avenue

*Ohio, Cleveland CLearwater 1-4609
Weschler Electric Company
4250 W. 130th Street
States: Ohio and Kentucky

Oregon, Portland BElmont 4-6683
The Instrument Laboratory
1316 S. E. 7th Avenue

*Pennsylvania, Philadelphia ORchard 3-5600
Sunshine Scientific Instrument
1810 Grant Avenue
States: Penn. Md. New Jersey below Trenton, Virginia, W. Virginia, Washington, D.C., Delaware

*Parts Depots

*Texas, Dallas TAylor 4-2626
Nelson Electronic Eng. Co., Inc.
6329 Gaston Avenue
States: Oklahoma and Texas

Texas, Houston CA 8-2835
Nelson Electronic Eng. Co., Inc.
3615 Gulf Freeway

*Washington, Seattle ATwater 3-5850
The Instrument Laboratory, Inc.
934 Elliott Avenue West
States: Oregon, Washington, Idaho and Montana

*Parts Depots

WARRANTY

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

Quality is the indispensable component
of every Simpson instrument . . . . . .